1: Pelzer S-5 (1940-1941) 1945 AL1 Southeast Asia AL1

by Westerners. This may be explained by the assumption that the ancestors of the Polynesians migrated from Southeastern Asia to the islands of the Pacific before cereals had replaced root crops as dominant plants.[13]

In Southeastern Asia we find both shifting and sedentary cultivators who depend exclusively upon root crops as a source of starch. The Nias, Mentawei, and Engano islanders off the western coast of Sumatra grew no grains until recently. Beside such root crops as taro (*Colocasia esculenta* Schott), yams (*Dioscorea* sp.), and *bira* (*Alocasia macrorhiza* (L.) Schott), they cultivated such other foods as bananas (*Musa sapientum* L.), sugar cane (*Saccharum officinarum* L.), and coconuts (*Cocos nucifera* L.). In the eastern parts of the Malay Archipelago and New Guinea the inhabitants depend chiefly on the starch of the sago palm (*Metroxylon sagu* Rottb.) which they either plant or collect in the wild state. Here, again, taro, yams, and bira are other sources of starch, as are such imported American plants as cassava (*Manihot utilissima* Pohl) and sweet potatoes (*Ipomoea batatas* Poir.). The folklore and religious practices of many tribes in Borneo and Celebes who today grow cereals recall the time when these tribes had only root crops.

In many parts of the Pacific taro is grown by sedentary cultivators on terraced, flooded fields.[14] We do not know whether the techniques of terracing and irrigation developed independently in Oceania and on the mainland, or whether the ancestors of the Polynesians brought their techniques with them from Southeastern Asia. If the latter be true, they must have left before the cultivation of rice was known to them; otherwise rice would have been among their crops. That it was not among them suggests that

[13] Forde: Habitat, Economy and Society, 1934, pp. 428–430. In remote centuries the Polynesians lived in the Malay Archipelago, where they cultivated such root crops as taro, yams, "arrowroot" (*Canna orientalis* Rosc.), and turmeric (*Curcuma* sp.), in addition to bananas and plantains (*Musa paradisiaca* L.), breadfruit (*Artocarpus communis* Forst.) and coconuts, all of which, according to the botanists, are natives of the forest regions of Southeastern Asia, whether the mainland or the Malayan Archipelago. All these plants were probably carried to Polynesia, either via a northern route through Micronesia or by a more southerly course through New Guinea and Melanesia. See Buck: Vikings of the Sunrise, 1938, pp. 305–309. The names of these plants were also carried into the islands of the Pacific. Variants of the names "taro" and "bira," to mention two examples, range from the Malay Archipelago far into Oceania. *Colocasia* is *talo* in Nias, *talas* in Sundanese, *tales* in Javanese, *dalo* in Fiji, *talo* in Samoan, *kalo* in Hawaiian, *taro* in Maori. *Alocasia* is known as *birah* or *bira* in Batak, *bira* in Madurese, *biga* in the Philippines, *piga* in Guam, and *vis* in Fiji. Later, the Polynesians, following the example of other peoples of the Pacific, were quick to adopt such New World crops as cassava and sweet potatoes as well as American fruit trees into their economy because these are closely related to their customary crops, but they still remain most reluctant to change from roots to grains as staple, possibly because "the cultivation of roots and fruit trees has little technical relation to the raising of grains, for they are not grown from seed but from eyes and cuttings." See Forde: *op. cit.*, p. 380. Another illustration of the fact that a plant, the introduction of which involves a change in methods of cultivation, is accepted only under pressure, is found in the history of the introduction of the potato into Europe.

[14] Krämer: "Der Taro und die Nasskultur," 1928, pp. 165–172; Rivers: "Irrigation and the Cultivation of Taro," 1926, pp. 262–287.

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ing crops. The process can be adapted to climate by manufacture either in shallow pits or low heaps."[64]

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Dry-Field Crops Cultivated by Peasants

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The list of dry-field crops cultivated in Southeastern Asia is rather large, but there are regional variations. Cassava, for example, is commonly grown on tegalans in Java (2,300,000 acres), whereas it is unimportant in Sumatra, Borneo, the Philippines (40,000 acres), Malaya (24,000 acres), and Indochina (75,000 acres). The most important dry-field crops are up-

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TABLE IV—CHEMICAL COMPOSITION OF CASSAVA AND IMPORTANT CEREAL FLOURS

	CASSAVA (PER CENT)	MAIZE (PER CENT)	WHEAT (PER CENT)	RICE (PER CENT)
Moisture	10.75	13.41	13.65	13.12
Protein	0.87	7.56	12.35	9.85
Crude fat	1.19	2.79	1.75	0.88
Ash	1.24	1.78	1.81	1.51
Crude fiber	6.12	3.19	2.53	0.63
Carbohydrates	79.83	71.27	67.91	74.01

Source: The Cassava Industry in the Philippines, 1939, p. 7.

land rice, maize, cassava, sweet potatoes, peanuts, soy beans and other pulses, tobacco, and sugar cane, all of which are annuals. Of the first four, only upland rice is a native of Southeastern Asia, whereas the other three are natives of the New World and were introduced into Southeastern Asia by the Spaniards in the sixteenth century.

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The inhabitants of Southeastern Asia have long relied upon root crops, fruits, leaves of various plants, and wild roots and tubers gathered in the forests, as well as upon rice. Scheltema refers to a number of early statements which indicate that "rice was not yet the principal food for a large portion of the native population [of Java] as late as the first part of the 19th century and that the rice diet has become much more important in the course of the past hundred years" as a result of the great extension of the cultivation of irrigated rice fields.[65] If it is correct that the rice consumption per capita increased during the past century, the opposite trend has been evident during the present century. For a while the increase in the area of irrigated land was great enough to allow for a larger rice production, but with the steadily increasing pressure of population the peasants now have to depend more and more upon unirrigated land. Thus the production of dry-field crops is gaining in importance.

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Authorities in Southeastern Asia have been especially worried over the increase of cassava production and consumption. Because of the exhaustion of the soil fertility on many dry fields, the growing of upland rice and

[64] Worthington: Science in Africa, 1938, p. 387.
[65] Scheltema: The Food Consumption, 1936, p. 10.

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241 134 [146] maize has become unprofitable, and many peasants have changed over to cassava, which makes lesser demands upon soil fertility. The per acre yields of cassava are high, and the plant is a source of carbohydrates, fat, and protein. From the standpoint of dietary needs, however, the ratio between carbohydrates on the one hand and protein and fat on the other is unfavorable. People who live on cassava merely fill their stomachs. The insufficiency of protein intake is detrimental to their health. Table IV compares the chemical composition of cassava, maize, wheat, and rice.

243 146 262 Maize, as the table indicates, compares quite favorably in protein content with wheat and rice and is especially rich in fat. It has gained an important position in the diet of the people of central and eastern Java, Madura, the island of Cebu, and the Cagayan Valley in the island of Luzon. Both maize and cassava are easy to store and therefore have a great advantage over sweet potatoes, which must be consumed soon after they ripen.

241 In Thailand maize is an important crop on the Khorat plateau and in other regions where dry land is available. Among the root crops cassava has gained a greater importance than taro and yams. The last two are grown mainly by Chinese gardeners in the neighborhood of large towns. Cassava, too, is grown commercially by Chinese, especially near the railroad on the peninsula.

Most of the so-called dry-field crops are grown in Indochina during the dry season on land that is flooded during the rainy season and at that time [311] produces rice. Gourou has estimated that in Tongking 100,000 hectares of land are used exclusively for the production of dry-field crops and that 350,000 hectares of irrigated land are occupied by such crops during the dry season.[66]

This practice of growing dry-field crops on irrigated land during the dry season is especially widespread in Java, where population pressure is so great that the peasants have to use every possible means to enlarge their food supply. If there is not enough water available to grow a second wet-rice crop, they will always try to get a second harvest of quick-growing dry-field crops during the dry season.

In contrast to the peoples of Java, the Filipinos do not, as a rule, go in for the raising of dry-field crops on wet riceland during the dry season, although this should be possible if the land were cultivated. There is enough water in the soil a short distance below the surface for the growing of crops practically everywhere during the dry season. Repeated tilling would keep the soil soft and fine so that water could move upward by capillary action to replace that which is lost through evaporation. Cultivation would enable plants such as maize, peanuts, and soy beans to grow on land that otherwise would be baked dry and hard. Although the ratio between cultivated land and population in the Philippines does not make a dry-season crop a necessity in most regions, there are a number of districts where the peasants traditionally raise a dry-season crop on irrigated

[66] Gourou: Les paysans, 1936, pp. 407–408.

1 [See page 75, cat 116 -- Analyst]

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great shoals of mackerel and bonito. Porpoises (mammals which live on fish and are a guide to the fish density) have been seen in a school which packed an area 15 miles long and 2 miles broad. Plankton occurs at times in astounding quantities, practically smothering all other fish life in the neighbourhood. The movements and migrations of these fish of deeper waters have been little studied and the inshore fishing has been enough to meet local food needs, as well as not demanding too complex a technique or too great a capital outlay by the local fishermen who are generally very few, and too poor to equip themselves for long distance deepwater trips. A major impediment to introducing the elaborate systems of trawling and seining which have been developed in temperate seas is the frequency of coral reefs and knolls which, although attracting fish, catch the nets and ruin them.

Fish as a Staple Food

Fish is a staple in the Southeast Asia diet as complement to rice. It supplies calcium, iodine and salt as well as animal protein, items otherwise not easily come by in these areas, or too expensive for the peasants. By habit Southeast Asia people are rice-fish-curry eaters and vegetables in the European sense enter very little into their meals. They are largely vegetarian but not interested in vegetables. Fishing has an importance in local ecologies second only to rice. In Malaya, for example, well over 80 lbs. of fish is normally consumed by every man, woman and child every year. When looking through the records of any one territory, however, the great significance of fish is not apparent because fishing is a mobile and widely dispersed activity not easily checked, the more illusive statistically because it plays little or no part in revenues.

Several stages of commercialisation are met with but subsistence fishing predominates. In every paddyfield and swamp, villagers go fishing for their personal needs; on the coast many fishermen are part-time, sharing their labour between a paddyfield and a fishing boat. Some villages have specialised fishermen whose produce goes into exchange among the landsmen to make the village self-supporting. Gradually fishing for sale has become possible, yet there are major difficulties of transport to consuming centres, of organisation between fishermen and consumer, and of preserving the fish in good condition during transport.

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SOUTHEAST ASIA NUTRITION DENSITIES
(Average number of persons per rice-acre per annum)

Quinquennium	*Burma*	*Indo-china*	*Siam*	*Java and Madoera*	*Philip-pines*	*Malaya*
1916–20	1.23	1.75	1.66	4.12	3.13	—
1921–25	1.19	1.67	1.57	4.27	2.67	5.61
1926–30	1.14	1.61	1.57	4.50	2.69	6.13
1931–35	1.19	1.64	1.63	4.60	2.76	6.42
1936–40	1.25	1.63	1.74	4.96	2.79	7.02
1946–50	2.0	2.1	1.6	5.9	3.9	7.2

Because population and the net production of food have increased *pari passu*, it is important to examine the "nutrition density" (persons per acre under rice) since the surplus for export depends on low internal consumption of the Southeast Asia staple and high internal production. The countries of Southeast Asia pre-war showed considerable differences in nutrition density, from Malaya (the plantation-mining specialist) with 7.2 persons per rice-acre, to Siam (the rice-surplus specialist) with 1.6. Malaya, Java and the Philippines had nutrition densities much higher than the rest of neighbouring countries and in the case of Malaya and Java the nutrition density had been steadily rising, whereas in Burma, Indochina and Siam it was fairly static. Over the same period, the domestic consumption of rice per person sharply dropped (by 20-25 per cent) in Burma, Siam and Java and rose about 10 per cent in Indochina, Philippines and Malaya. The postwar figures available show considerable increases of nutrition density everywhere except in Siam, yet these were changes of degree, not of pattern.

Changing Internal Emphasis

Today the very crowded places are firstly, Middle and North Java, Lower Siam and the Red River Delta, where densities of over 1,500 people per square mile occur, with secondary crowdings in Lower Burma, the Lower Mekong, Central Luzon and the Visayas. These concentrations of people are pre-eminently in agricultural areas (Fig. 116), and they are in fact largely made possible by exceptional soil qualities within an area whose general soil fertility is low. These crowded areas have taken part in a commercialisation of local agriculture and their subsequent history has been firstly a